MX*flex*®

2G/3G/4G/5G Multi-Technology Testing

Scanning Receiver | 30 MHz – 6 GHz

The PCTEL® MX*flex* scanning receiver is designed for benchmarking and co-managing multiple wireless network technologies across sub-6 GHz spectrum. 5G NR and 4×4 LTE MIMO measurements make it the ideal choice for optimizing user experience during the transition from 4G and 4.5G to 5G. The MXf*lex* scanner features concurrent scanning for fast multi-technology and multi-channel measurements.

Multiband

- Power Measurements (30 MHz - 6 GHz)
- 3GPP: All existing 2G, 3G, 4G, and 5G FR1 bands up to 6 GHz

Multi-Technology

- 5G NR
- LTE FDD
- TD-LTE
- NB-IoT
- UMTS
- GSM
- CDMA
- EV-DO

Custom Channel Power Measurements for additional technologies (TETRA, etc.)

Multi-Application

- Benchmarking while collecting up to eight technologies at the same time
- MIMO testing (4x4, 4x2 and 2x2)
- Baseline testing
- Integration testing
- Optimization testing

MADE IN THE USA
of U.S. and imported parts

PCTEL

Simplified benchmarking

Today's wireless networks are complex. The MX*flex* makes it easy to collect all of the data you need from 2G, 3G, 4G, and 5G networks. It's the ultimate benchmarking system.

Automatic Channel Detection

Need to determine the channel number to benchmark your competitor or to compare various operators? With the MX*flex*, you can start testing with minimal setup. PCTEL's Automatic Channel Detection (Blind Scan) and Mobile Blind Scan features quickly find every active channel across all bands and technologies.

One Unit, One Test

No need to worry about configuring multiple pieces of equipment or repeating each walk or drive test multiple times to cover every operator's network. The MX*flex* collects accurate data from multiple operator networks on up to eight (8) different technologies in a single test. You can also collect power measurements for additional technologies, such as P25 and TETRA.

No Data Gaps

Don't get caught with data gaps that require a retest. The MX*flex* collects measurements across multiple technologies concurrently, making it the fastest scanning receiver in the industry.

True 4x4 MIMO Measurements

4x4 MIMO is crucial for getting the best performance out of today's wireless networks. Other tools may require multiple pieces of equipment to provide even 2x2 MIMO measurements. With the MX*flex*, you'll get true 4x4, 4x2 or 2x2 MIMO measurements from a single piece of equipment.

WHY PCTEL?

Efficient Execution

Thorough and accurate RF data for better planning and more optimized rollout, with or without data from user equipment (UE).

ROI

Cost savings by collecting complete data set from all technologies, all bands with one scanner in a single test.

Peace of Mind

Industry-leading reliable platform with high dynamic range, accuracy, and performance.

Productivity

Single-box solution for multi-technology, multiband measurement support.

Flexibility

Support from multiple test vendors and on multiple operating systems for easy data collection and analysis.

Agile

Versatile tools designed for use in both indoor and outdoor environments.

MX*flex*® Specifications

5G New Radio (NR)

Measurement modes	NR TopN Signal: Synchronization channels (P-SS/S-SS) & PBCH, Blind Scan
Data modes	PCI, PSS-RP [dBm], SSS-RP [dBm], PSS-RQ [dB], SSS-RQ [dB], SS-CINR [dB], SSS-CINR [dB], RSPBCH-RP [dBm], RSPBCH-RQ [dB], RSPBCH-CINR [dB], SSB-RP [dBm], SSB-RQ [dB], SSB-CINR [dB], SSB-idx, SSB-RSSI, SSS-Delay Spread, Time Offset
Sub carrier spacing	15/30 kHz
Max. number of channels	24
Max. number of beams/channel	8
Measurement rate (typical)	30/sec
Dynamic range (CINR)	PSS/SSS CINR: -10 to +33 dB PBCH DMRS CINR: -8 to + 40 dB
Min. detection level RP	SCS @15 kHz: -135 dBm, SCS @30 kHz: -132 dBm
Accuracy (CINR) PSS/SSS, PBCH DMRS	+/- 2 dB
Max number of PCIs	16

LTE FDD and TD-LTE

Measurement modes	Top N Synchronization Channel Reference Signal (P-SCH/S-SCH) and Resource Block (Wideband, Subband); Dynamic Spectrum Sharing (DSS); Blind Scan; TopN eMBMS Multicast Reference Signal; Unicast Synchronization Channel Reference Signal and P-SCH/S-SCH
Data modes	RP, RQ, CINR, Cyclic Prefix, Time Offset, Delay Spread, Averaging; Layer 3; RF Path Measurements (4x1, 4x2, 4x4); LTE MIMO: CN, ECQI, Est. Throughput; eMBMS: Area ID, Cluster ID, Frame Configuration
Channel bandwidths	1.4/ 3 / 5 / 10 / 15 / 20 MHz
Max. number of channels	48 total between LTE FDD and TD-LTE
Antenna techniques	SISO, MISO, MIMO (4x4, 4x2, 2x2)
Measurement rate Top N Sync Channel RS Multicast RS	LTE FDD: 48/sec; 2x2 MIMO: 24/sec; 4x4: 3/sec TD-LTE: 19/sec eMBMS: 2/sec
Dynamic range (CINR) RS @ 20 MHz P-SCH/S-SCH Multicast RS	LTE FDD / TD-LTE: -26 to +40 dB LTE FDD: -10 to +22 dB; TD-LTE: -8 to +22 dB -9 to +30 dB
Min. detection level RSRP	-140 dBm @ 15 kHz
Accuracy (CINR) P-SCH/S-SCH & RS	± 1 dB (typical)
Max number of PCIs	16

NB-IoT

Measurement modes	Top N NRS (Narrowband Reference Signal), NPSS (Narrowband Primary Synchronization Signal), NSSS (Narrowband Secondary Synchronization Signal)
Data mode	NRS-RP, RQ: RSSI, CINR, Time Offset; NPSS-RP, RQ: RSSI, CINR; NSSS-RP, RQ: RSSI, CINR, Time Offset
Operation modes	In-Band, Guard Band, Stand-alone
Channel bandwidth NRS	180 kHz
Measurement rate	5/sec
Dynamic range (CINR) NRS	-10 to +40 dB
Min. detection level NRS RP	-138 dBm
Accuracy (CINR)	± 2 dB
Max. number of PCIs	16

GSM

Measurement modes	Color code, Blind Scan
Data modes	BSIC, C/I, RSSI, Layer 3
Channel bandwidths	30 kHz / 200 kHz
Measurement rate	Up to 196 BSIC decodes/sec
Dynamic range, C/I	+2 dB
Min. BSIC detection level	-110 dBm
Accuracy	± 1 dB

MX*flex*® Specifications

UMTS/WCDMA

Measurement modes	Top N Pilot, Blind Scan
Data modes	Io, Ec/Io, Aggregated Ec/Io, SIR, Rake Finger Count, Time Offset, Delay Spread, Layer 3
Channel bandwidths	200 kHz / 3.84 MHz
Max. number of channels	24
Measurement rate	47/sec
Top N CPICH dynamic range (Ec/Io)	-28 dB
Min. detection level	-127 dBm @ 90% Detection
Accuracy	± 1 dB
Max. number of Pilots	32

CDMA

Measurement modes	Top N PN, Blind Scan
Data modes	Ec, Io, Ec/Io, Aggregate Ec/Io, Pilot Delay, Delay Spread, Layer 3
Channel bandwidths	30 kHz / 1.25 MHz
Max. number of channels	24
Measurement rate	25/sec
Top N PN dynamic range, Ec/Io	-18.5 dB
Min. PN detection level	-120 dBm @ 90% detection
Accuracy	± 1 dB
Max. number of Pilots	32

EV-DO

Measurement modes	Top N PN, Blind Scan
Data modes	Ec, Io, Ec/Io, Aggregate Ec/Io, Pilot Delay, Delay Spread, Layer 3
Channel bandwidths	30 kHz / 1.25 MHz
Max. number of channels	24
Measurement rate	25/sec
Top N PN dynamic range, Ec/Io	-18.5 dB
Min. PN detection level	-120 dBm @ 90% detection
Accuracy	± 1 dB
Max. number of Pilots	32

Multi-Technology

Concurrent measurement capacity	Up to 3 technologies (Protocol Decoding) and 1 aggregate power measurement (RSSI, EPS, or Spectrum Analysis)
Measurement rate degradation when measuring 5G NR, LTE, and UMTS/WCDMA concurrently	None
Measurement rate degradation when measuring LTE, UMTS, and GSM concurrently	None
Measurement rate degradation when measuring LTE, CDMA, and EV-DO concurrently	None
Typical aggregate measurement rate	Up to 400/sec across 3 concurrent technologies

GPS

Type	50 channel internal receiver
Position accuracy	2.5 meters
Acquisition time	Cold start: <30 sec; Hot start: <2 sec
Sensitivity (tracking)	> -150 dBm

MX*flex*® Specifications

Mobile Blind Scan

Mobile Blind Scan performance in high speed mode with L3 (except for CDMA/EV-DO). Average sweep time based on a typical configuration: 8 LTE bands and 2 bands for each of the following technologies: UMTS/WCDMA, GSM, CDMA, EV-DO.

Protocol		
	GSM	6.24 sec
	UMTS/WCDMA	9.21 sec
	CDMA	9.83 sec
	EV-DO	5.47 sec
	LTE-FDD	6.86 sec
	TD-LTE	6.86 sec

Power Measurements

RSSI Measurements

Measurement rate (maximum, contiguous channels)	5G NR	5,200 ch/sec
	LTE	5,200 ch/sec
	NB-IoT	4,250 ch/sec
	UMTS	2,600 ch/sec
	GSM	2,600 ch/sec
	CDMA	4,000 ch/sec
	EV-DO	4,000 ch/sec

Custom channel power measurements (examples)	12.5 kHz (P25, DMR, EDACS, Analog LMR)	15,300 ch/sec (maximum, contiguous channels)
	25 kHz (TETRA, EDACS, Analog LMR)	7,650 ch/sec (maximum, contiguous channels)
	125 kHz (LoRa)	6,120 ch/sec (maximum, contiguous channels)
	250 kHz (LoRa)	5,355 ch/sec (maximum, contiguous channels)
	500 kHz (LoRa)	5,100 ch/sec (maximum, contiguous channels)

Dynamic range	-120 to -20 dBm @ 30 kHz
Absolute accuracy	± 1 dB (across basic RF input power range)

Enhanced Power Scan (EPS) Measurements

Channel bandwidths	5 kHz to 20 MHz in 2.5 kHz increments
Measurement rate	400 MHz/sec @ 5 MHz (typical)
Absolute accuracy	± 1 dB (across basic RF input power range)

Spectrum Analysis Measurements

Measurement range	>90 dB
Measurement rate (single sweep)	>110 MHz/sec
Sensitivity	- 110 dBm ± 1 dB @ 80 kHz; - 120 dBm min. discernable signal
Accuracy	± 1 dB (across basic RF input power range)

LTE Power Analysis Measurements (Available for TD-LTE only)

Channel bandwidths	1.4 / 3 / 5 / 10 / 15 / 20 MHz
Measurement rate	20/sec @ 20 MHz
Accuracy	± 1 dB (across basic RF input power range)

MX*flex*® Specifications

RF Characteristics

Frequency channel range	30 MHz to 6 GHz
Internally generated spurious response	- 100 dBm max.
Conducted local oscillator	- 100 dBm max.
RF input power range	- 10 dBm max. In-Band; +5 dBm max. Out-of-Band
Desensitization	Adjacent channel > 50 dB; Alternative channel > 60 dB
Safe RF input range	≤ 10 dBm
Frequency accuracy (ambient)	± 0.05 ppm (GPS locked); ± 0.1 ppm (GPS unlocked)
Intermodulation-free dynamic range, 2 tone (level 2)	- 40 dBm, 3.8 GHz, - 55 dBc (Typical), - 12.5 dBm TOI

Physical Characteristics

Input power	+10 to +16 VDC (80W nominal, 90W max.)
Size	9.5" D x 5.9" W x 4.3" H (241 mm D x 150 mm W x 110 mm H)
Weight	4.9 lbs. (2.2 kg)
Temperature range	Operating: 0°C to +50°C; Storage: - 40°C to +85°C
Humidity	5% to 95% relative humidity, non-condensing
Host data communications interface	USB 2.0
Antenna ports	RF: SMA Female (50Ω); GPS: Male (50Ω) SMB
Safety	EN 62368-1
EMC	EN 301 489- 1
Shock and vibration	MIL- STD- 810G, SAE J1455
RoHS	Directive 2011/65/EU and amendment 2015/863 (RoHS 3)

Solving Complex Wireless Challenges

PCTEL is a leading global provider of wireless technology solutions, including purpose-built Industrial IoT devices, antenna systems, and test and measurement products. Trusted by our customers for over 29 years, we solve complex wireless challenges to help organizations stay connected, transform, and grow.

For more information about the MX*flex* scanning receiver, contact your sales representative or visit

> pctel.com/scanning-receivers

PCTEL

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